ET1 - Engineering and technology impacts the world and the growth of humankind (ITEA – STL 1-7)

ET1.1 (K-4) *Demonstrate and identify reasons for the development of technology and its effects on humankind.*		**ET1.1 (5-8)** *Compare, contrast, and provide evidence of how technology influences history and impacts society.*		**ET1.1 (9-12)** *Identify the factors affecting technological advances (e.g. social, economic, political, cultural, environmental) throughout history.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET1.1 (K-2) **Students demonstrate an understanding of the nature of technology by:**	**ET1.1 (3-4)** **Students demonstrate an understanding of the nature of technology by:**	**ET1.1 (5-6)** **Students demonstrate an understanding of the impact of technology by:**	**ET1.1 (7-8)** **Students demonstrate an understanding of the impact of technology by:**	**ET1.1 (9-12)** **Students demonstrate an understanding of the influences of technology by:**	***Example Extensions*** **Students demonstrate an understanding of the influences of technology by:**
1a. investigating life without current technology (e.g. role-play use of the bucket brigade instead of a fire truck).	1a. comparing and contrasting life with and without current technology and how technology impacts everyday life.	1a. researching and displaying how historical events have inspired technological advancements (e.g. Cold War/Sputnik, slavery/cotton gin).	1a. describing how technological advances affect society (e.g. horse drawn carriages to automobiles).	1a. analyzing factors related to the development of technology and its effects on the rate of change.	1a. forecasting technological advancements based on potential needs and wants.
1b. describing how technology affects daily human routines (e.g. How does milk get from the cow to the home refrigerator?).	1b. recognizing that technology has positive and negative outcomes utilizing specific examples.	1b. listing and describing the importance of technology in daily life.	1b. comparing and contrasting the social and economic concerns that arise for the individual, the family, and/or the community as a result of technological advancements.	1b. assessing the relationship between available resources and the development of technology.	1b. developing technology to meet a need and identify potential tradeoffs.
1c. differentiating between needs/wants, helpful/ harmful, disposable/ reusable and natural/human-made products.	1c. identifying natural vs. human-made objects (e.g. classifying and categorizing objects in words, a table, chart and/or diagram).	1c. evaluating the many and varying uses of technology within different geographic regions (e.g. geothermal, tidal, and wind power).	1c. analyzing the use of technology within various cultures (e.g. Amish, Japanese).	1c. analyzing the evolution of factors affecting technological advances in a global environment (e.g. satellites, transportation, media).	

ET1 - Engineering and technology impacts the world and the growth of humankind. (ITEA – STL 1-7)

ET1.2 (K-4)
Discuss and define technology and its relationship to the natural and designed (human-made) world in the local community.

Grade Span Expectations (K-4)

ET1.2 (K-2)
Students demonstrate an understanding of the need for technology by:

2a. defining technology as something that makes life easier (e.g. clothes, telephone, automobile, microwave).

2b. discussing the purpose of technology and its relationship to the natural and designed world (e.g. how cutting down trees to manufacture lumber affects the forest habitat).

ET1.2 (3-4)
Students demonstrate an understanding of the need for technology by:

2a. defining technology as any process or invention that affects society (e.g. impact of the tractor on farming, indoor plumbing).

2b. discussing the purpose of technology and how it has affected human development (e.g. interview people from different generations to compare changes in lifestyles due to technological advancements).

ET1.2 (5-8)
Describe and demonstrate the effects of technological systems to humankind on a national scale.

Grade Span Expectations (5-8)

ET1.2 (5-6)
Students demonstrate an understanding of the outcomes of technology by:

2a. making connections between technological inventions and their impacts on a nation. (e.g. automobiles and highway systems; computerized machines and manufacturing).

2b. researching and analyzing the effects on humankind and the environment that a particular technology has had over a period of time (e.g. landfill, dam on a river, desalinization plant).

ET1.2 (7-8)
Students demonstrate an understanding of the outcomes of technology by:

2a. designing or improving a technological product and explaining how it may impact society. (e.g. vaccinations, television , cell phones, jumbo jets,)

2b. associating and illustrating the effects of particular technological systems over a period of time (e.g. waste disposal systems, potable water systems).

ET1.2 (9-12)
Analyze and explain advancements in technological systems and their impact on the world.

Grade Span Expectations (9-12)

Students demonstrate an understanding of the impacts of technology by:

2a. revising a current technological system and analyzing the global effects of the innovation (e.g. transition from fossil fuels to use of renewable resources).

2b. modeling and evaluating the design of a technological system and its impact on humankind.

Example Extensions
Students demonstrate an understanding of the impacts of technology by:

2a. designing a technological system to meet a specified need and analyzing its potential impact on the world (e.g. genetic engineering of crops).

ET2 - Effective design through engineering and technology is the outcome of a problem solving process involving the application of content knowledge, acquired skills, and creativity. (ITEA STL 8-13)					
ET2.1 (K-4) *Explore and recognize the attributes of the design process.*		**ET2.1 (5-8)** *Utilize the attributes of the design process to solve a real world problem.*		**ET2.1 (9-12)** *Evaluate the design and refine the design process used to solve a real world problem.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET2.1 (K-2) **Students demonstrate an understanding of the attributes of the design process by:**	**ET2.1 (3-4)** **Students demonstrate an understanding of the attributes of the design process by:**	**ET2.1 (5-6)** **Students demonstrate an understanding of the attributes of the design process by:**	**ET2.1 (7-8)** **Students demonstrate an understanding of the attributes of the design process by:**	**ET2.1 (9-12)** **Students demonstrate an understanding of the attributes of the design process by**:	**Example Extensions** **Students demonstrate an understanding of the attributes of the design process by:**
1a. asking questions, making observations, and brainstorming various ideas.	1a. defining a problem and expressing design ideas for that problem to others.	1a. defining a problem that addresses a scenario with given criteria and constraints.	1a. defining a problem that addresses a scenario by identifying its criteria and constraints.	1a. identifying in depth criteria and constraints by developing a concise problem statement	
1b. exploring solutions to a problem based on observations and brainstorming ideas.	1b. solving problems through the creation of design solutions.	1b. selecting an appropriate design solution for a given scenario or task.	1b. selecting and justifying an appropriate design solution for a given scenario or task.	1b. evaluating and finalizing the most appropriate design solution for a given scenario or task.	1b. reevaluating the process utilized in the development of the design solution with the goal of enhanced efficiency.
1c. completing tasks cooperatively in a group setting.	1c. identifying the characteristics of being an effective team member and working together to complete a task.	1c. explaining what makes an effective design team and working together to achieve a desired result.	1c. fulfilling a specific function as a team member to achieve a desired result.	1c. creating a team and assigning roles to team members for the purpose of achieving an overall desired result.	1c. identifying the personnel positions required to complete a task and the essential qualities required of each position.

ET2 - Effective design through engineering and technology is the outcome of a problem solving process involving the application of content knowledge, acquired skills, and creativity. (ITEA STL 8-13)

ET2.2 (K-4) *Explore and recognize basic technological products and systems, as well as their tools.*		**ET2.2 (5-8)** *Use and maintain technological products and systems, as well as their tools.*		**ET2.2 (9-12)** *Incorporate technological products, systems and their tools to achieve design solutions.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET2.2 (K-2) **Students demonstrate an understanding of technological products and systems by:**	**ET2.2 (3-4)** **Students demonstrate an understanding of technological products and systems by:**	**ET2.2 (5-6)** **Students demonstrate an understanding of technological products and systems by:**	**ET2.2 (7-8)** **Students demonstrate an understanding of technological products and systems by:**	**ET2.2 (9-12)** **Students demonstrate an understanding of technological products and systems by**:	**Example Extensions** **Students demonstrate an understanding of technological products and systems by:**
2a. identifying and safely using the required tools for a specific task.	2a. identifying and safely using lythe required tools and information resources for a specific task.	2a. safely using the required tools and organizing information resources for a specific task.	2a. explaining and safely using the required tools and organizing information resources for a specific task.	2a. selecting independently the proper tools or information resources used in completing a task.	2a. designing specific jigs and fixtures to expedite the task.
2b. collecting and using information about everyday products and symbols.	2b. using information to identify patterns within those systems.	2b. incorporating assigned materials and assigned measurement instrumentation throughout the design process.	2b. incorporating information, proper material selection and assigned measurement instrumentation throughout the design process.	2b. incorporating proper information, material selection and sophisticated measurement instrumentation throughout the design process.	
2c. exploring how things work.	2c. following step by step procedures and identifying sequential actions.	2c. using information to discover, diagnose and troubleshoot problems that arise in the course of building.	2c. using tools to diagnose, adjust, and repair problems that arise in the course of building.	2c. documenting, communicating, and evaluating processes and procedures used to build, operate, and maintain systems.	2c. creating technically written documentation to support a designed product.
2d. exploring the properties of a product (e.g. size, type of material, shape).	2d. identifying the effects of technology and comparing and contrasting tradeoffs (e.g. advantage of using scissors vs. paper cutter or tearing paper).	2d. interpreting and evaluating the accuracy of information for the purpose of developing possible solutions.	2d. interpreting and evaluating the accuracy of information for the purpose of developing possible solutions.	2d. synthesizing information to develop possible solutions and evaluate the designs .	2d. designing forecasting techniques.

ET2 - Effective design through engineering and technology is the outcome of a problem solving process involving the application of content knowledge, acquired skills, and creativity. (ITEA STL 8-13)

ET2.3 (K-4) *Explore the processes of research and development, invention and innovation, experimentation, and troubleshooting in planning practical solutions to problems.*		**ET2.3 (5-8)** *Utilize processes (i.e. research and development, invention and innovation, experimentation, and troubleshooting) in designs that use criteria and constraints leading to useful products and systems.*		**ET2.3 (9-12)** *Refine the processes of research and development, invention and innovation, experimentation, and troubleshooting for the purpose of achieving an optimal design solution.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET2.3 (K-2) **Students demonstrate an understanding of effective design by**: 3a. recognizing there are steps to solving a problem. 3b. experimenting / exploring with various materials (wheels, axles, gears, pulleys) to demonstrate their uses and discuss their differences. 3c. asking questions and making observations of design solutions (e.g. comparing toothbrush designs). 3d. comparing and contrasting various design solutions (e.g. bus vs. race car).	**ET2.3 (3-4)** **Students demonstrate an understanding of effective design by:** 3a. exploring the process of solving a real world problem. 3b. using age-appropriate construction materials to build a model to solve a specific problem. 3c. testing, troubleshooting, and evaluating a basic design solution. 3d. documenting the advantages and disadvantages of multiple designs (e.g. various designs of can openers).	**ET2.3 (5-6)** **Students demonstrate an understanding of effective designs of products and systems by:** 3a. formulating a process to solve a real world problem. 3b. utilizing materials provided to construct a working model for a given task (e.g. construct a contraption that utilizes all the simple machines – chain reaction machine). 3c. testing, troubleshooting, and evaluating an intermediate design solution. 3d. presenting their final working model for peer review and revision.	**ET2.3 (7-8)** **Students demonstrate an understanding of effective designs of products and systems:** 3a. formulating a process to solve a real world problem. 3b. utilizing materials provided to construct a working model for a given task. 3c. testing, troubleshooting, and evaluating a complex design solution. 3d. presenting their documentation, revisions, and final working model to their peers using a variety of technological tools.	**ET2.3 (9-12)** **Students demonstrate an understanding of what is an optimal design solution by:** 3a. formulating a process to solve a real world problem and justifying the selection. 3b. choosing appropriate materials to construct a working prototype. 3c. evaluating and refining a complex design solution for a working prototype. 3d. presenting comparative simulations/ prototypes and defending the selected solution.	**Example Extensions** **Students demonstrate an understanding of what is an optimal design solution by:** 3a. revising a process to solve a real world problem given unexpected constraints. 3b.developing an alternative solution to a design problem. 3c. researching the patent application process. 3d. presenting solutions to a community problem in a public forum (e.g. senior exhibitions).

ET3 - The designed world community selects and uses the appropriate technology. (ITEA – STL 14-20)

* See Introduction for Areas - *medical, agricultural and biotechnologies, energy and power, information and communication, transportation, manufacturing, and construction*

ET3.1 (K-4) *Recognize that there are various areas in engineering and technology.*		**ET3.1 (5-8)** *Explore the various areas in engineering and technology and their interconnections.*		**ET3.1 (9-12)** *Experience and implement the various areas in engineering and technology.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET3.1 (K-2) **Students demonstrate an understanding of the areas of engineering and technology by:**	**ET3.1 (3-4)** **Students demonstrate an understanding of the areas of engineering and technology by:**	**ET3.1 (5-6)** **Students demonstrate an understanding of the areas of engineering and technology by:**	**ET3.1 (7-8)** **Students demonstrate an understanding of the areas of engineering and technology by:**	**ET3.1 (9-12)** **Students demonstrate an understanding of the areas of engineering and technology by:**	***Example Extensions*** **Students demonstrate an understanding of the areas of engineering and technology by:**
1a. identifying community workers in these areas.	1a. identifying responsibilities of community workers in these areas.	1a. differentiating among the various engineering and technological careers (e.g. medical technologist vs. biotechnologist).	1a. researching and defining the requirements of a particular engineering / technological discipline.	1a. preparing a career portfolio of a particular engineering / technological discipline.	1a. participating in an internship or job shadowing opportunity in a particular engineering / technological discipline.
1b. making connections between these different areas (e.g. recognize that transportation tech-nologies are involved in construction).	1b. specifying and explaining the connections within these areas.	1b. researching the connections within these areas as they apply to an assigned product.	1b. evaluating the connections within these areas as they apply to an assigned product.	1b. evaluating the connections within these areas as they apply to a student designed product.	1b. manufacturing a product incorporating multiple areas.

ET3 - The designed world community selects and uses the appropriate technology. (ITEA – STL 14-20)
* See Introduction for Areas - *medical, agricultural and biotechnologies, energy and power, information and communication, transportation, manufacturing, and construction*

ET3.2 (K-4) *Select and utilize appropriate tools to measure, design, and implement specific technologies.*		**ET3.2 (5-8)** *Compare and contrast tools to measure, design, and implement specific technologies.*		**ET3.2 (9-12)** *Evaluate the effectiveness of tools to measure, design, and implement specific technologies.*	
Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		Grade Span Expectations (9-12)	
ET3.2 (K-2) **Students demonstrate an understanding of selecting appropriate tools by:**	**ET3.2 (3-4)** **Students demonstrate an understanding of selecting appropriate tools by:**	**ET3.2 (5-6)** **Students demonstrate an understanding of selecting appropriate tools by:**	**ET3.2 (7-8)** **Students demonstrate an understanding of selecting appropriate tools by:**	**ET3.2 (9-12)** **Students demonstrate an understanding of selecting appropriate tools by:**	***Example Extensions*** **Students demonstrate an understanding of selecting appropriate tools by:**
2a. recognizing that there are specialized tools for different areas of technology.	2a. identifying characteristics of appropriate tools within different technologies.	2a. comparing and contrasting tools used for the same purpose across different technologies (e.g. linear measurement tools in construction vs. biotechnology).	2a. researching and explaining the evolution of key tool(s) used in specific technologies (e.g. the evolution of the microscope in the medical area).	2a. evaluating the effectiveness of various tool(s) used in specific technologies.	
2b. experimenting with different tools for tasks (e.g. measuring with various tools – ruler, tape measure, string, etc.).	2b. experimenting and selecting the optimal tool for a given task in a specific area of technology.	2b. researching and selecting the optimal tool for a given task in a specific area of technology.	2b. researching and selecting the optimal tool for a student- selected task in a specific area of technology.	2b. developing or improving a tool for a specific technology.	